GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Plastics Engineering

Subject Code: DI04023021

Course / Subject Name: Designing of Injection Mould

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	Student should have knowledge regarding basic mould material & design.
Rationale:	A Plastic diploma engineer has to identify and select appropriate mold material. He has to plan and supervise design, fabrication, operation and maintenance of various types of injection moulds. This competency requires in depth knowledge of different types of Injection Moulds like two plate mold, three plate mould and moulds for products having undercuts and threads. Hence the course has been designed to develop this competency and its associated cognitive, practical and affective domain learning outcomes.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Select appropriate mould material for given requirements.	R,U
02	Prepare mould design checklist for given product.	R,U,A
03	Design & draw two plate and three plate injection mould.	R,U.A
04	Design & draw split mould.	U,A
05	Design & draw specialized injection mould.	U,A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
Unit – I Injection Mold Materials	**1.1** Introduction of Injection Mould and its products **1.2** Mold material selection criteria **1.3** Mould Material Selection Requirements with respect to : • Product Design • Mould Design • Mould Making • Moulding **1.4** Types of Mould Materials : • Plain Carbon Steels- Low Carbon Steel, Medium Carbon Steel, High Carbon Steel Alloy steels • Stainless steel • Prehardened Steel • Carburizing tool steels • Oil and air hardening tool steels	05	10 (7 Marks)
Unit – II General Mould Design Considerations	**2.1** Injection machine requirements with respect to mould : • Clamping side requirements : Clamping methods- Direct bolting and clamping, Clamping force, Tie-bar distance, Opening stroke, Maximum and minimum mold height • Injection side requirements: Plasticizing capacity, Shot Capacity, Injection Pressure **2.2** Design considerations for Injection molds: • Preliminary mold design • Detailed mold design **2.3** Number of impressions considerations **2.4** Gate balancing and runner balancing for balanced impression layout **2.5** Shrinkage Calculation – Linear and Volumetric Shrinkage **2.6** Venting- Significance and methods of venting **2.7** Taper Location Recess: • Taper location in Core Plate • Taper location in Cavity Plate • Comparison of Taper location in Core and Cavity Plate	13	30 (21 Marks)

	2.8 Limits, Fits & Tolerances For Mould Parts **2.9** Mould Cost Estimation process steps **2.10** Mould Assembling Procedure steps **2.11** Mould Designer's Check list points with respect to mold, product and injection machine **2.12** Mould Maintenance		
Unit – III Two Plate and Three Plate Injection Moulds	**3.1** Two-Plate Mould: • Introduction of Two Plate Injection Mould • Construction and working of Two Plate Mould – Single impression mold, multi-impression mold **3.2** Three-Plate Mould: • Introduction • Construction and Working: Stripper Plate Mould, Double Daylight Underfeed Mould, Double Daylight Underfeed-Stripper Plate Mould • Types and working of Opening Control Devices • Types of Runner Ejection Techniques **3.3** Comparison of Two Plate Mould with Three Plate Mould	09	20 (14 Marks)
Unit – IV Split Molds	**4.1** Significance of Split Mould Design **4.2** Undercut Product Examples Requiring Split Molds **4.3** Sliding Splits & Guiding Plate Designs **4.4** Constructional Details of Split Mould : • Split Actuation Methods • Split Locking Methods • Split Safety Arrangements	09	20 (14 Marks)
Unit – V Specialized Molds	**5.1** Moulds For Threaded Components • Introduction • Methods for Internally Threaded Components: Fixed Threaded Core Design, Stripping Method, Loose Threaded Core and Unscrewing Method • Methods for Externally Threaded Components: Fixed Threaded Cavity Design, Automatic Unscrewing, Stripping Method and Threaded Splits **5.2** Hot Runner Moulds • Introduction • Internally Heated Hot Runner Systems • Externally Heated Hot Runner Systems	09	20 (14 Marks)

	• Insulated Hot Runner Molding System • Advantages and Disadvantages **5.3** Introduction of Stack Moulds **5.4** Introduction of Interchangeable Insert Moulds		
	Total	**45**	**100 (70 Marks)**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
18	**31**	**21**	**---**	**---**	**---**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

S.No.	Title of Book	Author	Publication with place, year and ISBN
1	Injection Mold Design	Pye R.G.W	Affiliated East-West Press Pvt. Ltd, New Delhi, 2018, 5551234102501
2	The Complete Part Design Handbook	Campo, E.	Hanser Publications, Ohio, 2006, 9783446412927
3	How to Make Injection Molds	Menges, G., Michaeli, W., Mohren, P.	Hanser Publications, Ohio, 2001, 9781569902820
4	Injection Mold Design Handbook	Caoen B., Rees H.	Hanser Publications, Ohio, 2022, 9781569908150
5	Injection Mold Design Engineering 2e	Kazmer, D.	Hanser Publications, Ohio, 2016, 9781569905708
6	Plastics Mold Engineering Handbook	Dubois J.H., Pribble W.I	Springer US, 2013, 9781468465808
7	Plastics : Product Design and Process Engineering	Harold Belofsky	Hanser-Gardner Publications, 1995, 9781569901427

8	Injection Mould Design Fundamentals	Denton E.N & Glanvill A.B.	Industrial Press, 2011, 9780831110338
9	Plastic Materials & Processes	Schwartz S.S. & Goodman S.H.	Van Nostrand Reinhold, 1982, 9780442227777
10	Plastic Engineering Handbook	Berins M.L	Van Nostrand, 1991, 9780412991813
11	Injection Moulding Handbook	Rosato D.V & Rosato D.V	Springer Science & Business Media, 2012, 9781461545972
12	A Textbook of Workshop Technology	Khurmi R.S & Gupta J.K	S. Chand and Company Limited, 2018, 9788121908689

(b) Open-source software and website:

1. https://www.cavitymold.com/injection-mold-steel-types
2. https://www.plasticmoulds.net/mould-steel.html
3. https://www.injectionmould.org/2019/03/13/mold-venting/
4. https://www.youtube.com/watch?v=DSQcd-iP92M&ab_channel=KennyHan
5. https://www.youtube.com/watch?v=uEO_jDE5oQ8&ab_channel=LucasSantos
6. https://www.smlease.com/entries/plastic-design/two-plate-vs-three-plate-mold
7. https://www.plasticmoulds.net/two-plate-moldthree-plate-moldhot-runner mold.html
8. https://www.youtube.com/watch?v=6-yschQdn1s&ab_channel=PLASTOTECH
9. https://www.youtube.com/watch?v=gzuU52voc3o&ab_channel=JITINDIA
10. https://www.scribd.com/presentation/355502430/Types-of-Moulds-split-Mould
11. https://www.youtube.com/watch?v=b1U9W4iNDiQ&ab_channel=tronicarts Multimedia-Agentur
12. https://www.youtube.com/watch?v=kNEoBvKy_nw&ab_channel=JITINDIA
13. https://makenica.com/hot-runner-systems-in-injection-molding
14. https://www.youtube.com/watch?v=mneg6ID4fsw&ab_channel=Tech2Research

Suggested Practical List:

Sr. No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs Required
1	Draw plan and sectional elevation of different injection molded parts with actual dimensions.	4

2	Sketch various types of balanced layout for multi impression Mold.	2
3	Draw sectional elevation and plan of two plate mold for given Plastic products.	4
4	Draw detail drawing of two plate injection mould for given Plastic products.	4
5	Draw sectional elevation and plan of three plate mold.	2
6	Sketch various runner ejection techniques	2
7	Sketch various undercut products for split mold.	2
8	Draw sectional elevation and plan of split mold.	2
9	Sketch various split actuation methods.	2
10	Sketch various split safety arrangements.	2
11	Sketch various internally and externally threaded Components.	2
12	Draw constructional details of any one hot runner mold.	2

Suggested Activities for Students:

1. Students will prepare chart of mold material classification.
2. Students will prepare injection machine requirements with respect to mold.
3. Students will collect products suitable for two plate and three plate molds.
4. Students will collect products suitable for split molds.
5. Students will collect products with internally and externally threaded components.
6. Students will visit nearby mould making industry

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